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Integration of a Problem-based Learning Module into a Post-graduate Pain Medicine Education Program

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

Objective: To examine the outcome of substituting a traditional "lecture series" structure with a postgraduate Problem Based Learning (PBL) structure in the context of a pain medicine educational program. The primary outcome is to assess trainee satisfaction, the PBL experience and whether PBL was useful for exam preparation.
Methods: A non-randomized prospective study of non-consultant anesthetic trainees (n=25) was undertaken before and after the introduction of a new PBL program in pain medicine. Two learning packages, each of 12 weeks duration, were delivered over the course of 2 academic terms. There were specific improvements in the leadership and the structure of the sessions (including the

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introduction of a trained facilitator).
Feedback was collected through a self-developed questionnaire, comprising rating items on a five point Likert scale, enquiring about their PBL experience, objective understanding, whether PBL was useful for exam preparation, and its comparison to didactic teaching.
Results: 25 trainees completed both learning packages. A significant improvement in all aspects of the learning experience was reported (average improvement 1.5 fold (range 1.3-2.0) $p < 0.05$). 60% - 80% of trainees endorsed the new PBL structure. 92% of trainees felt that the overall learning experience with PBL model was good. The proactive role of a facilitator was important (60% of trainees strongly agreeing with this element) and it was the single highest positive aspect of the program.
Conclusion: The implementation of a PBL system into a pain medicine postgraduate program can create a positive learning atmosphere, improve the trainee satisfaction and should enrich the learning experience in the area of pain medicine.

Keywords: Pain medicine education; problem-based learning; post-graduate learning; trainee satisfaction.

1. BACKGROUND

The majority of non-consultant anesthetists are exposed to pain medicine during their training years in the form of didactic lectures given by a senior anesthetist with little opportunity to engage or challenge the concepts. This format is seen as the "best" way of delivering the information required using local expertise and within the time limitation of most post-graduate educational programs. Problem Based Learning (PBL) has shown to provide a better learning experience in medical education [1] but it is not a format typically used in pain medicine. PBL is a trainee-centered approach with the overall goals to help develop flexible knowledge, effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation [2].

Pain medicine can be broadly divided into two educational areas. Firstly, there is the fundamental theoretical understanding of pain and the clinical treatment options for specific pain conditions. Secondly, there is the interventional skills such as undertaking specific pain blocks that requires detailed technical knowledge in order to learn the skill. While both areas can be regarded as separate there is enormous overlap. Therefore providing education in one aspect without addressing the other would be an ineffective education program.

It was our belief that in order to improve the learning experience in pain medicine as a whole the implementation of a PBL model seemed the most suitable choice at our center. The aim of this study is to substitute a traditional "lecture series" structure with a postgraduate Problem Based Learning (PBL) model at Department of Pain Medicine and assess the outcome. The outcome was to assess trainee satisfaction, the PBL experience and whether PBL was useful for exam preparation, in comparison to didactic teaching.

2. METHODOLOGY

2.1 Study Design

This is a descriptive analytical study. A non-randomized prospective sample was used. Participants were non-consultant anesthetic trainees (n=25). The Cork University Hospital Ethics Committee approved the research proposal. The anonymity of participants was preserved and ethical regulations were duly followed.

2.2 The "Trainee" Cohort

The non-consultant anesthetic trainees ("trainees") rotating in our hospital are part of the national anesthetic training program. The majority will have received limited or no formal education in pain medicine as there are only 5 designated pain training centers recognized by the College of Anesthetists in Ireland. Trainees are reliant on our educational program to provide them with adequate training in order that they can complete their competency.

Pain medicine training is incorporated into the modular educational structure on offer to individuals at our department. The training is designated an equal amount of formal teaching time compared to intensive care medicine, obstetric training and general anesthesia. This is

in the form of a weekly lecture that offers the trainees the opportunity to deal with the theoretical aspect of pain medicine in a formal didactic setting.

2.3 Pain Education Pre-PBL Model

Typically there are 25 non-consultant hospital doctors (trainees) in our department. The pain medicine education program in place was an established lecture session as part of the department of anesthesia' education program since 2011. The sessions were structured such that was the trainees were asked to present a 30-minute lecture on a pain medicine "topic" at 7:30 am once weekly. There were 16-18 sessions in each 6-month session. At the start of each term trainees were asked to "pick" their preferred title from a list of "topics". The clinical experience of the presenters was not considered but could vary from less than 6 months to 18 months at most. A pain consultant was present at all of presentations to "over see" the meeting.

2.4 Audit and Assessment

In 2013 an internal feedback on trainee satisfaction with the program was undertaken. This feedback was used to design and improve the educational pain medicine model. Reaction to the traditional lectures was generally positive but there was a reported low attendee satisfaction in many aspects of the program. In particular the "value" of attending a lecture at 7:30 am on a weekly basis was questioned. Over time the attendance numbers declined and the interest in pain medicine as a possible career enhancing experience suffered.

In general the trainees felt that this was partly related to the lack of clear guidance, poor direction and limited senior support. These factors influenced the ability to engage with the chosen topics on the agenda. Overall the value of the meeting was perceived as poor. The standard of the presentations and the effort of the presenters suffered in turn.

2.5 Introduction of the "New" PBL Pain Program

A new pain educational program was put in place with a clear date for each session outlined in advance. Two learning packages, each of 12 weeks duration, were designed and delivered over the course of 2 academic terms (12 months total) at the same start time (07:30). The two key improvements included:

2.5.1 Improved leadership

A program coordinator was appointed to ensure a point of contact for the speakers and attendees. The responsibility of the coordinator was:

- To ensure the content of the teaching session was focused around a specific pain topic.
- To ensure that a reminder email was posted to all trainee's 3 days before the actual presentation confirming the topic, the speaker and that reading material was attached with this email if appropriate.
- To ensure each speaker (a) provided 3 Multiple Choice Questions based on the content of their presentation and (b) provided one key reference paper that they found most useful as an additional reading.

2.5.2 Improved session structure

Each session was scheduled to last 40 minutes. It was divided into two parts:

- Trainees would deliver a didactic presentation of no more that 20 minutes using traditional tutorial style. "Powerpoint" style presentations were permitted with the presenter able to control all the content and features to his / her choosing. There were clear written instructions provided to the presenter requesting them to give an overview of the key aspect of the topic.
- No topic would be repeated within the 12 months cycle.
- The title of each session was (i) more focused and (ii) was deliberately posted in an interesting way in an attempt to intrigue the trainee. Speakers were encouraged to use case study models where possible.
- A single facilitator was appointed for the duration of the series to provide continuity. The facilitator was experienced in the PBL style of education. He was a trained examiner and an experienced pain clinician. The facilitator was provided with advice in relation to "How to create effective PBL scenarios" as outlined in Table 1 [3]. The facilitator was with a directed to focus on specific questions for discussion and he was instructed to be proactive during the PBL sessions.

- In particular the facilitator was guided in relation to their role which was [3].

  a) To facilitate the proceedings to maintain group dynamics and moving the group through the task.
  b) To ensure that the group achieves appropriate learning objectives in line with those set by the curriculum design team.
  c) To ensure that the students have done the appropriate work.
  d) To encourage trainees to check their understanding of the material by using the MCQ as a dynamic educational tool to encourage the trainees to ask open questions and ask each other to explain topics in their own words or by the use of drawings and diagrams.

While attendance at the pain sessions was completely voluntary trainees were aware that attendance was recorded as part of the routine departmental audit and continued professional assessments.

2.6 Data Collection

Trainee feedback regarding their learning experience was collected through a self-developed questionnaire, comprising rating items on a five point Likert scale, enquiring about their PBL experience, objective understanding, whether PBL was useful for exam preparation, and its comparison to didactic teaching.

An open-ended question, about how to improve the blended learning experience, was also included. Questionnaires were distributed and collected during the final PBL session at the end of the module. Any individual who was not present at the final session was provided with a paper copy of the questionnaire via internal post. They were asked to return the assessment to the coordinator within 7 days.

2.7 Attendance Target

In our department there are 25 trainees. Given that 5 individuals are on leave at any one time and 5 are post call, and would therefore be unlikely to be able to attend, the maximum attendance number at any one time would be 15 individuals.

Trainees would be asked to complete the questionnaire to assess the program only if they had attended 5 of the session in each of the 6 months (minimal 40% attendance rate).

The clinical experience of the presenters was not considered but could vary from less than 6 months to 18 months at most.

2.8 Statistical Analysis

Descriptive statistics including mean of responses and distribution of Trainees' final grades in summative assessment were used. Student t-test was done to assess any statistical significance using Excel 2010.

Table 1. How to create effective PBL scenarios*

▪ Learning objectives likely to be defined by the students after studying the scenario should be consistent with the faculty learning objectives
▪ Problems should be appropriate to the stage of the curriculum and the level of the students' understanding
▪ Scenarios should have sufficient intrinsic interest for the students or relevance to future practice
▪ Basic science should be presented in the context of a clinical scenario to encourage integration of knowledge
▪ Scenarios should contain cues to stimulate discussion and encourage students to seek explanations for the issues presented
▪ The problem should be sufficiently open, so that discussion is not curtailed too early in the process
▪ Scenarios should promote participation by the students in seeking information from various learning resources

**Adapted from Dolmans et al. Med teacher 1997;19:185:9; Wood D. Problem based learning. British Medical Journal 2003: 326: 8*

3. RESULTS

3.1 Overall

Two programs of 12 sessions each were successfully completed. The mean age of the trainee group was 27.5 years (SD 2.5 years) and the mean anesthetic experience was 3.5 years (SD 2.56). The attendance for the sessions were significantly improved compare the previous 12 months (Pre-PBL 30% v Post-PBL 75% (n=25, p = .05). An average attendance rate of 75% of the maximum number available was achieved within the first 3 sessions of each term and was sustained until the end of the series. All trainees were asked to complete the final questionnaire as an attendee and as a presenter if this was applicable. Table 2 highlights that the trainees felt the new module educational structure significantly improved all aspects of the learning experience. On average all domains improved 1.5 fold (range 1.3-2.0) compare to pre-PBL levels.

3.2 Attendee's Response

The post-PLB feedback was very positive. Most trainees' found that the new style was suited to the area of pain medicine. Some trainee's were unsure about the concept of PBL in the beginning but within 3 sessions felt found it "engaging". The consistently high attendance rate indicated that this was probably true.

Table 3 shows the features of the PBL program that appealed to trainees. On average 82.6% (SD 10.2) of trainees agreed or strongly agreed that the PBL structure was useful (range 64-100%). 92% of trainees felt that the overall learning experience with PBL model was good. The discussion element hosted by the facilitator seemed to be an important aspect with 60% of trainee "strongly" agreeing with this aspect. This was the highest positive feedback quality of the program.

Attendees were generally satisfied with the quality and improved availability of a facilitator because it seems to add clinical depth to their educational experience.

Examples of the comments on open feedback included:

a) It allowed individuals the opportunity to interact with a consultant who they would have otherwise rarely have met.
b) It broadened their appreciation of the area of pain medicine and in improved their clinical knowledge.
c) There was increased the likelihood that they would apply for a clinical placement in pain medicine at designated centers in the future.
d) The MCQ structure helped in relation to future examination preparation.

Table 2. Compares the trainees impression before (pre) and after (post) introduction of the PBL model

Question	Pre - PBL	Post -PBL	P value	Test	Ratio of variance
1. The title of the topics encouraged you to attend	2.92 (0.57)	4 (1.0)	<0.001	4.6	0.25
2. The presentations were clear and focused	2.44 (0.76)	3.9 (0.53)	<0.001	8.1	0.67
3. The support provided prior to the presention was adequate	2.96 (0.84)	3.8 (0.6)	<0.001	4.4	0.66
4. The support provided by the attending consultant is adequate on the morning of the presentation	2.96 (0.84)	4.5 (0.86)	<0.001	6.6	0.48
5. The present learning structure is adequate for your learning needs	2.52 (0.65)	4.12 (0.72)	<0.001	8.1	0.44
6. Based on this experience would you consider Pain medicine as a future career option	1.56 (0.82)	3.12 (1.4)	<0.001		0.24

(n=25 mean (SD), Student t-test (one-direction))

Table 3. Shows the features of the PBL program that appealed to the majority of trainees (%)

For attendees (N=25)					
In relation to your experience with the problem based learning (PBL) style did:	**Strongly agree**	**Agree**	**Neurtal**	**Disagree**	**Strongly disagree**
	5	**4**	**3**	**2**	**1**
The educational objective of PBL was adequately explained to me	8	56	24	12	
The content of the presentations were useful	12	56	24	8	
The discussion session was useful	36	56	8		
The PBL sytle session helped you with your examination preparation	16	52	32		
After the program I would consider the taking the exam diploma in pain medicine	8	12	60	12	8
The MCQ material was useful	16	68	16		
Compared to “traditional” teaching (lecture only) did PBL add positively to your learning experience	20	64	8	8	
For presenters (N =18)					
Did you present YES / NO	72				28
If so please comment					
The provision of a “focused” topic proved helpful in your preparation of the material	32	52	16		
Having access to a “co-ordinator” helped you prepare the material with greater ease	24	60	16		
Having to prepare the MCQ’s was useful	36	52	12	0	
The discussion element with the “facilitator” improved the quality of your session	60	40			
The overall PBL structure was a good learning experience	72	20	8		

Table 3 shows the features of the PBL program that appealed to the majority of trainees. On average 82.6% (SD 10.2) of trainees agreed or strongly agreed that the PBL structure was useful (range 64-100%). 92% of trainees felt that the overall learning experience with PBL model was good. The discussion element with the facilitator seemed to be an important aspect with 60% of trainee strongly agreeing with this element. This was the highest positive feedback aspect of the program

3.3 Presenters’ Response

There were 18 different presenters with 6 individuals presenting twice within the 12 months (Table 3). In general the presenters found that:

a) Having focused topics to present was very helpful as it allowed them narrow in on specific issues quickly.
b) The need to have MCQs available proved a positive learning challenge.
c) Having a designated coordinator and a facilitator were important.
d) The presenters felt that their “presentation mattered” they were prepared to invest more time into the preparation than they would normally have done in the previous structure.
e) Those who presented for a second time said they were more satisfied with the second presentation. They felt that this was because understood the “theory behind the PBL better the second time”.

4. DISCUSSION

The implementation of a PBL system through varying instructional approaches in a trainee-centered manner can create a positive and collaborative learning atmosphere. Our results suggest that it can improve the trainee satisfaction and enrich the learning experience in the area of pain medicine. This supports previous reports in the literature on the impact of such blended methodology on clinical education of healthcare trainees in surgery [3,4,5]. Our study

examines this for the first time in the area of pain medicine. The impact on the long-term academic performance needs to be established [6,7].

The reason for the success of the PBL model in our pain medicine educational program may be that PBL is particularly suited to educating trainees who are at different stages of their career pathway. In fact PBL has been applied at various stages within a trainee's medical education careers, from theoretical acquisition of basic sciences, to clinical education, clinical practice, and postgraduate studies with reported success [8,5,9]. The influence of a facilitator seems to be a very important element among the trainees. Ensuring that there is "support" for the facilitators would therefore seem prudent.

It was not surprising that some trainees were apprehensive about the new format. It is reported that students were initially apprehensive about decreased instructor communication in the blended learning system such as PBL, but such concerns were superseded by increased attention towards their own time management skills. Nevertheless, face-to-face interaction was still highly valued [10,11].

We believe including the feedback of those who presented was valuable. It gave an insight into the level of engagement that could be achieved among the trainees by offering them a level of responsibility in keeping with their experience. The results confirm that this had a positive effect.

Unfortunately in general the majority of trainees do not peruse pain medicine as a career. There are many reasons why this is so. Certainly the one-dimensional didactic lectures, which have traditionally being used to "educate" trainees' does not present pain medicine as an exciting and progressive career opportunity. The use of creative and novel educational program design is a simple and important step to promote pain medicine education. The results suggest that 1 in 5 of trainees would consider the area as a career option. Based on experience the actual number is likely to be much less.

5. LIMITATIONS

The author accepts that the small sample size in a very discrete area of medicine increases the risk of bias in the results. The results must be interpreted with this in mind. Although the data was collected in a blinded fashion both the coordinator and the facilitator work in the same department as the trainees. The trainee may feel obliged to give a positive response. However even allowing for these limitations the outcome is still a significant improvement.

The success of the facilitation relies on the facilitators' preparation before each session. This is time consuming for the facilitator and requires advanced planning. For our sessions there was only one facilitator, which ensured minimal variation in style. In order to distribute the work load in the future additional facilitators should be involved. We recognize that not all individuals will have the same ability as facilitators. Ensuring uniformity between facilitators would be challenging and may require a separate preparation program to be considered in the future.

We also accept that this article may not develop the PBL technique in the classical sense but rather it may be more a "Blended Learning Technique." PBL requests the learning process starts from a problem rather than a theme and occur in small groups following the steps as according to the so called Steps Method: Harvard Medical School, Six Steps Method or Maastricht Medical School; Seven Steps in PBL. [1]. In our model we commenced from a theme but used the PBL process.

The actual improvement on trainees practice of pain medicine was not assessed therefore the true educational and clinical impact is difficult to quantify. PLB as part of a blended teaching structure could play an important role in this and need to be assessed. It is accepted that the ratio of presentations to PBL session was set at 50:50. It was felt that this was a reasonable compromise at this stage of the module development and one that would not be too alien to the trainees. The trainees were still in the process of preparing for the traditional examinations.

6. CONCLUSION

In conclusion this study suggests that post-graduate trainees in pain medicine would accept PBL as an educational model. We propose that replacing didactic lectures with PBL modules could significantly enhance trainee performance in the area of pain medicine. This would support the outcome in other healthcare areas where it is increasingly being accepted that the method of blended learning are generally enjoyed by students, and increasing voices are suggesting its superiority over traditional didactic approaches.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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